

# Microbiological guideline values of foodstuffs on the 'use by' or 'best before' date

Recommendation on 10 October 2022

English version 19.4.2023

Finnish Food and Drink  
Industries' Federation



## INTRODUCTION

The EU regulation on microbiological criteria for foodstuffs (EU 2073/2005 including amendments) and the Finnish Food Authority's *Elintarvikkeiden mikrobiologiset vaatimukset ohjeessa toimijoille* ("Instructions for the industry concerning the microbiological requirements for foodstuffs") of 2021 specifies examinations and guideline values for certain foodstuffs. A large number of foodstuffs fall outside the scope of these guidelines as we attempt to unify examinations and guideline values in this document. The recommendation does not include the examination of pathogenic microbes (such as *Salmonella*, *Listeria monocytogenes*). The guideline values are recommended to be used in food laboratories in order to harmonize the laboratory studies and the statements issued on them. The examinations and guideline values presented in the recommendation are not legally binding.

You have now in your hands an updated recommendation containing more product groups and supplemented with plant protein -based products and dairy product groups. The microbiological guideline values for foodstuffs in this recommendation are based on the results of self-monitoring by companies in the food industry and cooperation of food microbiology experts. This recommendation is based on years of work experience and material based on analytics.

When interpreting microbiological analyses, you must always consider the number of aliquots. The recommended number of aliquots is typically three. Other quantities may also be possible, depending on the risk assessment. If an evaluation is based on a single sample, this must be indicated in the statement. In addition to a microbiological study, a sensory evaluation of foodstuffs must always be included in the interpretation of results.

### The product groups are presented in the following tables:

1. Processed foods, incl. cooked plant protein products in product groups 1a–1e
2. Fresh vegetables, salads, grated vegetables, fresh-cut fruits and vegetables and sandwiches and rolls containing raw raw materials
3. Meat products in product groups 3a–3c
4. Minced meat and raw meat products in product groups 4a–4c
5. Fresh fish, shellfish, processed fish and roe in product groups 5a–5d
6. Dried plant-based products
7. Dairy products and spreads in product groups 7a–7L

The 2022 update was made by the food safety group of the Finnish Food and Drink Industries' Federation, consisting of 17 experts in food microbiology and hygiene. The food safety group was chaired by Quality Manager **Heidi Nisula** from Domretor Oy, with Branch Manager **Elisa Piesala** of the Finnish Food and Drink Industries' Federation (ETL) as secretary. The previous recommendation was updated 2017. .

This recommendation is public and available on the ETL website in Finnish and English.  
<https://www.etl.fi/aineistot/ohjeet.html>

If a laboratory applies the values of this recommendation in its statement, the laboratory must refer to this recommendation (for example, Microbiological guideline values of foodstuffs on the 'use by' or 'best before' date of the Finnish Food and Drink Industries' Federation, 2022).

The working group hopes that this recommendation will be useful to food laboratories, educational institutions and the industry in the evaluation and interpretation of the microbiological quality of foodstuffs.

Helsinki, 10 October 2022  
**FINNISH FOOD AND DRINK INDUSTRIES' FEDERATION**

## A few notes to help interpret the recommendation:

### 1. The guideline value terms and their interpretation

**m** = if the guideline value is repeatedly exceeded and the situation must be evaluated (lowercase m)

**M** = if the guideline value is exceeded, a risk assessment must be conducted, and the party must take action if necessary (uppercase M)

2. The microbiological guideline values have been determined to apply to the 'use by' or 'best before' dates of foodstuffs. If analyses are done during the shelf life, this must be taken into account when interpreting the results.

3. When doing a shelf-life test, you must always also conduct a sensory evaluation (whether an item is fit for selling). Microbiological results must be interpreted together with sensory results.

4. Certain foodstuffs may contain natural or added microbiota. These include salamis, cheeses, fermented vegetables and cultured dairy products, and foodstuffs containing them. This must be taken into account in the choice of analyses.

5. Fresh vegetables, salads and fruit (group 2) contain yeasts naturally, although there are considerable differences between them. Any analysis result must always be interpreted together with the sensory results. A product may not be considered to be of poor quality merely on the basis of high yeast content. For example, Chinese cabbage contains more yeast than white cabbage. Different growing conditions (e.g. open field, greenhouse, country of origin, irrigation water) affect the amount of microbes. The amount of enterobacteria also varies considerably naturally from one vegetable to the next. This is why enterobacterial analysis is not recommended for products that contain both cooked and raw plant components.

6. If the cultivation of a vegetable (group 2) being studied has involved biopesticides (e.g. *Bacillus thuringiensis*), this may interfere with determining the *Bacillus cereus* group. In such cases, the guideline value m for fresh vegetables and salad should be: 1 000 pmy/g and for M: 10 000 pmy/g. If the salad also contains other than fresh plant components, then M: 1 000 pmy/g.

In the Finnish Food Authority's guidelines on the microbiological requirements of foodstuffs [https://www.ruokavirasto.fi/globalassets/tietoa-meista/asiointi/oppaat-ja-lomakkeet/yritykset/elintarvikeala/elintarvikealan-oppaat/elintarvikkeiden-mikrobiologiset-vaatimuks-et\\_4095\\_04\\_02\\_00\\_01\\_2020\\_4\\_liitteet-yhdistetty.pdf](https://www.ruokavirasto.fi/globalassets/tietoa-meista/asiointi/oppaat-ja-lomakkeet/yritykset/elintarvikeala/elintarvikealan-oppaat/elintarvikkeiden-mikrobiologiset-vaatimuks-et_4095_04_02_00_01_2020_4_liitteet-yhdistetty.pdf) the interpretation of *B. cereus* group results is discussed in section 6.6.4 *Bacillus cereus* -group.

7. The *Bacillus cereus* group consists of *Bacillus cereus*, *Bacillus weihenstephanensis*, *Bacillus thuringiensis*, *Bacillus mycoides*, *Bacillus pseudomycoides* and *Bacillus anthracis*, which cannot be distinguished from each other by biochemical means. *Bacillus thuringiensis* can be distinguished from other *Bacillus cereus* species using a new microscopic method.

8. The total microbial level of raw meat products (group 4), especially those prepared by ageing (group 4c), may be high owing to the lactic acid bacteria naturally present in them. This is why any analysis result must always be interpreted together with the sensory results. A product may not be considered to be of poor quality merely on the basis of high total level of microbes or lactic acid bacteria. A high level of lactic acid bacteria is typical for meats prepared by ageing (4c), which is why we primarily recommend that you test them for *E. coli* and by means of a sensory evaluation.

9. The monitoring of trends and changes in products is more important than any individual analysis. If the guideline values are exceeded, the situation must be assessed and corrective measures decided on.

10. Not all microbes presented in this document need to be checked regularly, but on a risk basis. If the need arises, examinations for other bacteria, yeasts, moulds or viruses may also be conducted.

## Quantitative analysis, pmy/g

1. PROCESSED FOODS	m	M
<b>1a Cooked minced meat products, cooked plant protein products</b>		
Aerobic microbes	1 x 10 <sup>5</sup>	1 x 10 <sup>6</sup>
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Yeasts	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Mould	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Sulphite-reducing Clostridia (modified atmosphere and anaerobic packaging)	10	1 x 10 <sup>2</sup>
<b>1b Cooked in a vacuum (does not include sterilised products) E.g. Sous-vide products, microwave food, soups and sauces</b>		
Aerobic microbes	1 x 10 <sup>3</sup>	1 x 10 <sup>5</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Sulphite-reducing Clostridia	10	1 x 10 <sup>2</sup>
<b>1c Salads and sandwiches with cooked raw materials</b>		
Mould	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Aerobic microbes **)	1 x 10 <sup>5</sup>	1 x 10 <sup>6</sup>
Coagulase-positive staphylococci / <i>S. aureus</i>	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
**) If the product contains salami or cheese, the values will be exceeded because of the starters.		
<b>1d Pizzas, hamburgers, hot dogs, bakery products, crêpes Ready-made, heated according to instructions</b>		
Aerobic microbes	1 x 10 <sup>5</sup>	1 x 10 <sup>6</sup>
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Yeasts	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Mould	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Coagulase-positive staphylococci / <i>S. aureus</i>	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Sulphite-reducing Clostridia (modified atmosphere and anaerobic packaging)	10	1 x 10 <sup>2</sup>
No yeasts or sulphite-reducing Clostridia are examined in bakery products.		
<b>1e Casseroles, food cooked uncovered in the microwave, cabbage rolls Ready-made, heated according to instructions</b>		
Aerobic microbes	1 x 10 <sup>5</sup>	1 x 10 <sup>6</sup>
Mould	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Yeasts	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Sulphite-reducing Clostridia	10	1 x 10 <sup>2</sup>

## Quantitative analysis, pmy/g

2. FRESH VEGETABLES	m	M
<b>Salads, grated vegetables, and sandwiches and rolls containing raw raw materials</b> <i>Eaten as such, industrially produced, incl. fresh-cut vegetables and fruits</i>		
Yeasts ( <i>see note 5</i> )	1 x 10 <sup>4</sup>	5 x 10 <sup>5</sup>
Mould	5 x 10 <sup>3</sup>	5 x 10 <sup>4</sup>
<i>Bacillus cereus</i> group ( <i>see notes 6 and 7</i> )	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Coagulase-positive staphylococci / <i>S. aureus</i>	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<i>Escherichia coli</i>	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
3. MEAT PRODUCTS	m	M
<b>3a Cooked meat products (sausages, slices, strips etc.)</b>		
Aerobic microbes	1 x 10 <sup>6</sup>	1 x 10 <sup>7</sup>
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Lactic acid bacteria	1 x 10 <sup>6</sup>	1 x 10 <sup>7</sup>
Sulphite-reducing Clostridia (modified atmosphere and anaerobic packaging) (not containing nitrite)	10	1 x 10 <sup>2</sup>
Coagulase-positive staphylococci / <i>S. aureus</i> ( <i>slices</i> )	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>3b Liverwurst (also sliced)</b>		
Aerobic microbes	1 x 10 <sup>6</sup>	1 x 10 <sup>7</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	5 x 10 <sup>2</sup>
Sulphite-reducing Clostridia (modified atmosphere and anaerobic packaging) (not containing nitrite)	10	1 x 10 <sup>2</sup>
<b>3c Salamis (also sliced)</b>		
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<i>Escherichia coli</i>		10
<i>Clostridium perfringens</i>	10	1 x 10 <sup>2</sup>
<i>This product group is naturally high in aerobic bacteria owing to the use of starters.</i>		
4. MINCED MEAT AND RAW MEAT PRODUCTS	m	M
The limit values for minced meat and raw meat products are listed in the EU regulation on microbiological criteria for foodstuffs (EU 2073/2005). The sensory quality must always be examined in all raw meat products. ( <i>See note 8</i> )		
<b>4a Minced meat and raw meat products (industrial)</b>		
Aerobic microbes / lactic acid bacteria	5 x 10 <sup>7</sup>	1 x 10 <sup>8</sup>
<i>Escherichia coli</i>	5 x 10 <sup>2</sup>	5 x 10 <sup>3</sup>
<b>4b Raw sausages</b>		
Sulphite-reducing Clostridia	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Aerobic microbes	5 x 10 <sup>7</sup>	1 x 10 <sup>8</sup>
<i>Escherichia coli</i>	5 x 10 <sup>2</sup>	5 x 10 <sup>3</sup>
Coagulase-positive staphylococci / <i>S. aureus</i>	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>4c Beef products prepared by ageing</b> <i>The amount of aerobic microbes may not exceed those of lactic acid bacteria.</i>		
<i>Escherichia coli</i>	5 x 10 <sup>2</sup>	5 x 10 <sup>3</sup>

## Quantitative analysis, pmy/g

5. FISH AND FISH PRODUCTS	m	M
<b>5a Raw fish, e.g. shellfish, fresh or frozen</b>		
Aerobic microbes / lactic acid bacteria	$1 \times 10^6$	$1 \times 10^7$
Bacteria producing hydrogen sulphide	$1 \times 10^5$	$1 \times 10^6$
<b>5b Cooked fish products and hot-smoked fish</b>		
Aerobic microbes	$1 \times 10^5$	$1 \times 10^6$
Yeasts	$1 \times 10^3$	$1 \times 10^4$
Enterobacteriaceae	$1 \times 10^2$	$1 \times 10^3$
Coagulase-positive staphylococci / <i>S. aureus</i>	$1 \times 10^2$	$1 \times 10^3$
Sulphite-reducing Clostridia	10	$1 \times 10^2$
<b>5c Cold-smoked and gravad fish, vacuum-packed (RTE)</b>		
Aerobic microbes	$1 \times 10^6$	$1 \times 10^7$
Bacteria producing hydrogen sulphide	$1 \times 10^5$	$1 \times 10^6$
<i>Escherichia coli</i>	$1 \times 10^2$	$1 \times 10^3$
Enterobacteriaceae	$1 \times 10^3$	$1 \times 10^4$
Coagulase-positive staphylococci / <i>S. aureus</i>	$1 \times 10^2$	$1 \times 10^3$
Sulphite-reducing Clostridia	10	$1 \times 10^2$
<b>5d Roe, fresh or frozen</b>		
Aerobic microbes	$1 \times 10^6$	$1 \times 10^7$
Bacteria producing hydrogen sulphide	$1 \times 10^5$	$1 \times 10^6$
Yeasts	$1 \times 10^4$	$1 \times 10^5$
Coagulase-positive staphylococci / <i>S. aureus</i>	$1 \times 10^2$	$1 \times 10^3$
Sulphite-reducing Clostridia	10	$1 \times 10^2$
<b>6. DRIED PLANT-BASED PRODUCTS</b>		
<b>Spices, dried herbs, tea ingredients, powdered berries</b>		
<i>Eaten as such</i>		
Total amount of microbes	$1 \times 10^6$	$1 \times 10^7$
Yeasts	$1 \times 10^4$	$1 \times 10^5$
Mould	$1 \times 10^3$	$1 \times 10^4$
<i>Bacillus cereus</i> group (see notes 6 and 7)	$1 \times 10^3$	$1 \times 10^4$
<i>Escherichia coli</i>	$1 \times 10^2$	$1 \times 10^3$
Sulphite-reducing Clostridia	$1 \times 10^2$	$1 \times 10^3$

## Quantitative analysis, pmy/g, liquid pmy/ml

7. DAIRY PRODUCTS and EQUIVALENT MILK-FREE and PLANT-BASED PRODUCTS		
	m	M
<b>Liquid neutral products</b>		
<b>7a Pasteurised products/drinks</b>		
Total amount of bacteria	5 x 10 <sup>4</sup>	1 x 10 <sup>5</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>7b Extended shelf life products/drinks</b>		
Total amount of bacteria	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>7c UHT products (incl. infant formula)</b>		
Total amount of bacteria	0	10
<i>Bacillus cereus</i> group	0	10
<b>Acidic products</b>		
<b>7d E.g. yoghurts, quark, buttermilk, plant-based acidified products, juices and berry products</b>		
Total amount of bacteria (not acidified)	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Foreign microbes (fermented and containing probiotics)	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Yeasts	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Mould	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>Neutral, other than liquid products</b>		
<b>7e E.g. puddings, mousses, overnight oats, smoothies</b>		
Total amount of bacteria	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Yeasts	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Mould	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<i>Bacillus cereus</i> group	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>7f Matured cheeses</b>		
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
Mould	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>7g Blue cheeses</b>		
Enterobacteriaceae	1 x 10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>7h Unripened cheeses and processed cheeses and their plant-based equivalents, buttermilk cheeses, cottage cheeses</b>		
Total amount of bacteria	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Foreign microbes instead of total amount of bacteria in cottage cheese	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Enterobacteriaceae	10 <sup>2</sup>	1 x 10 <sup>3</sup>
Yeasts	10 <sup>2</sup>	1 x 10 <sup>3</sup>
Mould		

The table continues on the following page. >

## Quantitative analysis, pmy/g, liquid pmy/ml

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7. DAIRY PRODUCTS and EQUIVALENT MILK-FREE and PLANT-BASED PRODUCTS		
	m	M
<b>Neutral, other than liquid products</b>		
<b>7i Fats and spreads</b>		
Enterobacteriaceae	10 <sup>2</sup>	1 x 10 <sup>3</sup>
Yeasts	10 <sup>2</sup>	1 x 10 <sup>3</sup>
Mould	10 <sup>2</sup>	1 x 10 <sup>3</sup>
<b>7j Milk and whey powders</b>		
Total amount of bacteria	1 x 10 <sup>4</sup>	5 x 10 <sup>4</sup>
Yeasts	10	10 <sup>2</sup>
Mould	10	10 <sup>2</sup>
<b>7k Powdered infant formula</b>		
Total amount of bacteria	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>
Yeasts	10	10 <sup>2</sup>
Mould	10	10 <sup>2</sup>
<b>7L Ice cream</b>		
Total amount of bacteria	1 x 10 <sup>3</sup>	1 x 10 <sup>4</sup>

This recommendation is evaluated regularly and will be updated when we receive new information about microbiological risks or when a product group must be added or removed.

The first recommendation was published in 2000 and this is the fifth update. This recommendation replaces the one dated 8 June 2017. Positive feedback from users of this recommendation has encouraged us to make new updates and to expand the product groups.

This is the first English version.

We wish to thank everyone who has participated in and users of this recommendation.

**Finnish Food and Drink Industries' Federation / Food safety group**  
 Pasilankatu 2, P. O. Box 115, 00241 Helsinki  
 Phone: +358 9 148 871  
 Email: [etl@etl.fi](mailto:etl@etl.fi), additional information [www.etl.fi](http://www.etl.fi)